Sharpener

BACKGROUND

The invention concerns a sharpener for pencils having a lead, such as graphite pencils, crayons and in particular cosmetic pencils and similar items.

Existing sharpeners have a housing with an opening into which a pencil to be sharpened can be inserted. The one end of this pencil thereby comes into contact with a cutting edge arranged at an angle to the length axis of the pencil so that a rotating movement or a screw-like movement of the pencil creates a conical point at the end of the pencil around its length axis.

These familiar sharpeners can be used for sharpening pencils with an essentially cylindrical pencil lead that have a carrier body surrounding the lead, which is usually made of wood and has a circular or hexagonal cross-section.

For many types of pencils, in particular cosmetic pencils and similar items, there is a desire to shape a point that is non-conical. This is due in part to the fact that the material used for this point is very soft and that, on the one hand, there is desire for steady positioning of the color lead and, on the other hand, for a contact surface that is not too large for application of the material from the point.

The task of the invention, therefore, is to create a sharpener for sharpening pencils, which is technically configured in a different manner. In particular, the task of the invention is to create a sharpener for sharpening pencils that can be used to sharpen pencils that have essentially any type of carrier body cross-section and can sharpen the point on the lead in a reliable manner.

SUMMARY

In accordance with the invention, a pencil sharpener is proposed that has a cutting device, a holding device for the pencil, at least one housing and a forcible guide device.

In accordance with the invention, the pencil is received in particular by the holding device. The holding device thereby preferably grabs the pencil about its exterior. The holding device is arranged within the sharpener in such a way that a free end of the pencil, the end that will be sharpened, is located outside of the holding device so that the cutting device can make contact with it. Preferably, the pencil will be held inside the holding device in a rotationally fixed manner so that rotation around an axis parallel to its length axis is prevented. It is especially preferred that the pencil to be sharpened is received in the holding device in a form-fitting manner. Preferably the pencil will be placed in the holding device so that it may move in an axial direction with respect to its length axis and so that it can be moved in the direction of the cutting device.

The housing will preferably have at least two housing parts, of which one will be a lid. The housing parts are connected with one another. In particular the housing parts are welded, specifically using ultrasound welding, glued or screwed together.

The forcible guide device has at least one guide element and at least one guide track in which the guide element is forcibly guided upon sharpening of the pencil.

The guide track is formed in particular from a cam or at least contains such a cam. Especially preferred is to form the guide track as a groove. It is preferred that the guide track is formed by a profiling. Especially preferred is to form the guide track from

a groove that has a constant or varying groove depth. A forcible guide that is realized by means of a varying groove depth or a forcible guide realized by means of the groove path, or the combination of these forcible guides is particularly preferred in accordance with this invention.

According to a particularly preferred configuration of the invention, there is a disk that stretches concentrically around the holding device, which can hold the pencil whereby there is a groove with a varying groove depth running along the perimeter on the exterior of this disk so that at least one guide pin that is connected with the housing engages this groove and changes the position of the pencil or the holding device relative to the housing in accordance with a predetermined characteristic.

It is especially preferred to arrange grooves on one or both faces of a disk that extends concentrically around the holding device, into which guide pins connected solidly to the housing extend, whereby these grooves match with respect to their paths or at least differ in their path.

The guide track or groove is a closed track. The guide element is particularly preferred to be formed as a guide pin, which is specifically guided in a groove.

Several differently shaped guide tracks are preferable.

Already the use of one guide groove offers the advantage of being able to guide the holding device in a predetermined manner upon rotation around the axis.

The use of two guide grooves that are arranged on both sides of the disk-shaped seat of the holding device and into which a pin solidly connected with the housing

respectively extends, offers the significant advantage that the movement track of the pencil can be selected in any manner relative to the knife fastened to the housing.

For an elliptical pencil, it is preferably the case that one guide track ensures that the pencil can be moved up and down whereas the other guide track causes the pencil to be moved to and from the blade. This creates a chisel-shaped cutting edge that can be used with thick color pencils or cosmetic pencils to great advantage.

In particular, a suitable selection of guide grooves can ensure that the position of the lead against the blade is optimal and, in particular, that the free angle needed for a good cut will be in the respective optimal range.

A sharpener as described in the invention can be used in particular for pencils that have a lead that is randomly shaped in cross-section. This lead can, in particular, be formed in a non-rotational symmetrical manner. Preferably the cross-section of this lead has an elliptical shape. The lead carrier can also have essentially any shape and, in particular, an elliptical shape.

In addition, a sharpener as described in the invention can be used, in particular, according to the shape of its forcible guide device for a number of other shapes of the lead carrier, which, in particular, has a wood cover essentially running along the lead axis, and surrounding the lead axis and thereby especially protecting it.

Especially preferred are two grooves on the respective faces, which serve to guide a pin placed firmly in the housing.

The cutting arrangement, i.e. specifically the blade, is preferably fixed relative to the housing. Especially preferred is a rigid connection of the blade with the

housing, which in particular is achieved by means of a screw connection or similar type of connection.

It is preferred that the pencil is received in the holding device in a rotationally fixed manner in relation to its length axis whereby the holding device, along with the pencil, is arranged for movement relative to the cutting device. The pencil is preferably received in the holding device in a form-fitting manner. During sharpening of the pencil, the holding device, and thereby the pencil are moved relative to the cutting device.

The pencil is preferably axially movably received in the holding device so that it can be moved in the direction of the cutting device and the cutting surface of the pencil can be shaped by means of a rotating movement of the pencil relative to the cutting device.

In accordance with an especially advantageous configuration of the invention, the forcible guide device or the path of the groove, into which a pin reaches, or the cam is formed in such a way that the free angle upon sharpening is constantly between 2° and 10°, preferably mainly between 3° and 5°, and is especially preferred to be 3°. The free angle is preferably held constant during sharpening of the pencil. It is also preferred that the free angle remains within an interval of 1° when sharpening.

It is preferable that the sharpener has a sealing device. This sealing device specifically insulates the guide tracks so that the guiding mechanism does not become hindered by invasive materials, such as shavings or similar materials.

The sealing disk is, in particular, made of a material that has POM or polyamide or Derin or Hostaform, whereby Derin and Hostaform are product names.

The sharpener especially has a guide track that allows for the sharpening of an elliptical pencil with ellipse ratios of essentially 1.3:1 through 1.6:1 with an essentially free angle. It is especially preferred that the ellipse ratio of the pencil is essentially 1.45:1. Other ellipse ratios as well as other shapes of the pencil in accordance with the invention.

Preferably, the sharpener has a container for catching shavings that are produced during sharpening. Such a container can be configured as a collection cap or a shaving capture container which is essentially adjacent to the blade and is made to be transparent.

Preferably, the guide disk is guided between to planar surfaces, which prevent movement of the guide disk in an axial direction, i.e. perpendicular to the flat planar surface.

Preferably, the exterior wall of the housing has an opening through which a pencil can be inserted into the housing for sharpening, and which is covered at least partially by a covering that is, in particular, formed as a disk. This covering will be spring-loaded against the housing from the interior side of the housing. The covering will have a passage through which the pencil and, if necessary, a part of the guide device for this pencil will extend. The passage is thereby designed in such a manner that the holding device or the pencil rests on the surrounding wall of the opening. The housing is thereby, essentially covered in the area of the opening through which the pencil is

inserted for sharpening and in which it is moved perpendicular to its length axis upon sharpening. The covering is thereby arranged perpendicular to the length axis of the pencil and movable relative to the housing and is pressed against the housing using a spring in each of the resulting possible relative positions with respect to the housing.

The sharpener is preferably made, at least in part, of a high-grade synthetic material, such as POM. In particular, the guide track and/or the holding device and/or the guide pin and/or the container are made from a (high-grade) synthetic material.

The cutting device, or the blade, is preferably made from hardened steel. In particular it is planned that the holding device contains the guide sleeve. Especially preferably, the holding device is the rotating insert, or vice versa.

In a preferred formation, the sharpener has a rotating insert that has a guide sleeve with a circumferentially extending wall section. This wall section limits an empty space in which the pencil can be received upon sharpening, in particular form fittingly. In this preferred formation the rotating insert has another support section over which this rotating insert can be supported in an axial direction.

Preferably the support section is formed in such a way that it extends in a radial direction.

It is preferable that the guide sleeve have a varying wall thickness in the circumferential direction. It is especially preferred that the wall thickness of the guide sleeve is essentially constant in an axial direction.

The path of the wall thickness of the guide sleeve in the perimeter direction will preferably influence the shape of the pencil to be sharpened.

It is especially preferable that the support section is arranged at the axial end of the guide sleeve. The support section is preferably supported on a housing section and in particular in an axial direction. Preferably the support section is supported in an axial direction on a housing wall section that essentially runs in a radial direction.

Preferably there is a housing insert that is made of multiple parts, for example, two-parts. The housing insert can be formed in such a way that it has a dividing plane that is essentially arranged perpendicular to the longitudinal axis. In a preferred embodiment, there are at least three cam guide surfaces arranged on or in the housing insert.

In particular, there can be a housing insert with two parts and at least one cam arranged on each part on the side facing the housing interior.

It is further preferred that the housing insert has a wall section at both axial ends which respectively extends in a radial direction and is equipped with an opening. The guide sleeve can run through this opening. Preferably, at least one limitation wall of this opening will work as a cam guide surface.

It is especially preferred that there be three cams which are situated next to one another in an axial direction.

Preferably, at least one cam or a cam set has an opening which is, for example, a through passage and radially inwardly extends in an axial direction. The guide sleeve can be inserted through this opening. This opening is preferably formed in such a way that the guide sleeve can be received in a form-fitting manner, in particular in a rotationally fixed manner.

It is preferred that at least three cams are connected with each other as one piece.

It is further especially preferred that at least three cams are connected in one piece with the guide sleeve.

Preferably the housing is sealed, particularly on the end. One or more seals can be used for this purpose.

In a preferred embodiment, there are at least two cam guides arranged at an angle of 120° to one another.

It is further preferred that at least two cam guides are arranged at an angle of 60° to one another. Preferably, the cam guides are planar, whereby at least two cam guides are used whose perpendiculars enclose an angle of 120°.

BRIEF DESCRIPTION OF THE DRAWINGS

In the following, the invention is described in greater detail using the figures that are not intended to limit the invention.

The figures illustrate the following:

Fig. 1 is a first exemplary embodiment of the invention in a schematically, partially cut view;

Fig. 2 is a first cutaway view of the illustration in Fig. 1;

Fig. 3 is a second cutaway view of the illustration in Fig. 1;

Fig. 4 illustrates the position of the knife blade in a first position of the pencil;

Fig. 5 illustrates the position of the knife blade in a second position of the pencil;

Fig. 6 illustrates the position of the knife blade in a third position of the pencil;

Fig. 7 illustrates the position of the knife blade in a fourth position of the pencil;

Fig. 8 is a second exemplary embodiment of the invention in a schematic, partial cutaway view;

Fig. 9 is a cutaway view along the line 9-9 in Fig. 8;

Fig. 10 is a side view from the direction of the arrow 126 in Fig. 8;

Fig. 11 is a cutaway view along the line 11-11 in Fig. 10;

Fig. 12 is an exemplary embodiment of the invention in schematic illustration;

Fig. 13 is a cutaway view as viewed from line 13-13 in Fig. 12;

Fig. 14 is a cutaway view as viewed from line 14-14 in Fig. 12;

Fig. 15 is a cutaway view as viewed from line 15-15 in Fig. 12;

Fig. 16 is a cutaway view as viewed from line 16-16 in Fig. 12;

Fig. 17 is a cutaway view as viewed from line 17-17 in Fig. 12;

Fig. 18 is an exemplary embodiment of the invention in schematic illustration;

Fig. 19 is a cutaway view as viewed from line 19-19 in Fig. 18;

Fig. 20 is a cutaway view as viewed from line 20-20 in Fig. 18;

Fig. 21 is a cutaway view as viewed from line 21-21 in Fig. 18;

Fig. 22 is a cutaway view as viewed from line 22-22 in Fig. 18;

Fig. 23 is an exemplary embodiment of the invention in schematic illustration;

Fig. 24 is a cutaway view as viewed from line 24-24 in Fig. 23;

Fig. 25 is a cutaway view as viewed from line 25-25 in Fig. 23;

Fig. 26 is a cutaway view as viewed from line 26-26 in Fig. 23;

Fig. 27 is a cutaway view as viewed from line 27-27 in Fig. 23;

Fig. 28 is an exemplary illustration of the invention in schematic illustration;

Fig. 29 is a cutaway view as viewed from line 29-29 in Fig. 28;

Fig. 30 is a cutaway view as viewed from line 30-30 in Fig. 28;

Fig. 31 is a cutaway view as viewed from line 31-31 in Fig. 28;

Fig. 32 is a cutaway view as viewed from line 32-32 in Fig. 28;

Fig. 33 is an exemplary embodiment of the invention in schematic illustration in partial cutaway view; and

Fig. 34 is an exemplary embodiment of the invention in schematic illustration in partial cutaway view.

DETAILED DESCRIPTION

Figure 1 shows an exemplary embodiment of the sharpener 1 in accordance with in the invention that is designed to sharpen essentially elliptical cosmetic pencils with an essentially chisel-shaped point.

The sharpener has a housing, which in its entirety has been designated with the reference number 10. The housing has an essentially cylindrical section 10a that is partially covered by an annular plate 10b.

An essentially cone-shaped tapering 10c has been shaped onto this annular plate 10b, upon which the knife blade 12 made of hardened steel has been fastened using a screw 11.

The knife blade has been formed in a conventional manner, i.e. it has been configured as an essentially flat plate which on the surface directed towards the cutting side has a blade edge 12b and a point 12c (Fig. 4).

The inner cylindrical space 10d of the housing 10 is closed with a housing lid 13 that is essentially of annular shape and fastened onto the housing 10 with screws 13a that engage screw taps 10e in the housing 10.

It is noted that instead of this screw fastening, another connection between the housing lid and the housing can be used.

A holding device is arranged within the housing, which in its entirety is designated with the number 14.

The holding device 14 consists of a first tube-shaped holding part 14a adapted to the contour of the pencil to be sharpened and an essentially disk-shaped part 14b, which are preferably connected together in one piece.

The holding device 14 is received in the cylindrical hollow space 10a of the housing 10 in such a way that the holding device can be rotated relative to the housing.

For this purpose, the housing lid 10 is equipped with a drill-hole 13b that is formed in such a way that it enables an undisturbed rotational movement of the tube-shaped attachment 14a.

As already mentioned, the tube-shaped attachment 14a is formed in such a way that at least the inner contour is adapted to the outer contour of a pencil 16 with a length axis 18.

The disk-shaped part 14b of the holding device has a first end wall 22 and a second end wall 24. There is a first groove 26 in the first end wall and a second groove 28 in the second end wall 24. A first pin 30 held firmly in the housing 10 reaches into the groove 26 and a pin 32 held firmly in the housing lid 13 reaches into the second groove 28.

The dimensions of the first and second grooves 26, 28 and of the first and second pins 30, 32 have been chosen in such a way that the pins can slide into the grooves.

There is also a sealing disk 34, which preferably is made of synthetic material and is placed between the disk-shaped part 14b and the lid 13. This groove serves only for purposes of sealing and also facilitates movement of the annular part 14b.

As can be clearly seen in Fig. 1, an essentially conical, cup-shaped container 36 is placed on the disk-shaped attachment 10b, which is set upon an attachment 10g of the circular part 10b. This container preferably consists of synthetic material, especially preferably of transparent plastic.

Fig. 2 shows a partial cutaway view along line 2-2 in Fig. 1. Here the shape of the groove 28 can be seen clearly.

Fig. 3 shows another cutaway illustration from which the shape of the groove 26 is apparent. The shape of the groove or grooves is determined in particular by a reverse calculation from the desired rolling movement during sharpening.

As can be seen in Fig. 3, the first groove 26 is essentially elliptically shaped whereby the elliptical shape essentially corresponds to the elliptical shape to the corresponding opening of the tube-shaped attachment 14a of the holding device. In other words, the curve track 26 is essentially elliptically concentric to the elliptical contour of the pencil 16.

As can be seen in Fig. 2, the second groove is also essentially approximately elliptically shaped, but the ellipse here is, roughly stated, tipped at an angle of 45°. One could also call it a distorted ellipse.

The function of the sharpener described in the invention is now described in reference to Figures 4 through 7:

Since the annular attachment 14b of the holding device 14 is held between the disk-shaped attachment 10b of the housing and the housing lid 13, it cannot move in a direction along the axis 18 of the pencil. With respect to the housing 10, the annular

attachment 14b thereby executes a planar movement. The movement of a body may be presented familiarly as the sum of a translation movement with a rotation movement about the respective rotating axis in question. A planar movement, as in the preceding instance, thereby yields three degrees of freedom, specifically two movement possibilities in the X and Y planes (which is not displayed and which would run perpendicular to the axis 18 in this instance) and a rotation movement.

Because both guide pins 30 and 32 are anchored firmly in the housing and both guide grooves 26 and 28 on the other hand are arranged firmly in the annular attachment 14b, there are two fixed points for the movement of the disk-shaped part 14b in reference to the housing 10 so that only one degree of freedom remains.

This means that a rotation of the pencil 16 leads to an exact pre-determined movement of the holding device 14 in reference to the housing 10 and thereby in reference to the knife blade 12 that is connected firmly to the housing.

Figures 4 through 7 illustrate the shape of this movement.

The knife 12 is arranged in such a way that it lies at a free angle 40 against the point of the pencil to be sharpened. When the pencil 16 is rotated, it is moved, as shown in Fig. 4 through 7, in such a way up and down along the arrow direction 50 and back and forth along the arrow direction 52 so that this free angle is maintained in all positions of the pencil.

First, this achieves the exact predetermined shape of the point of the pencil, a chisel-shaped point in the present case.

Second, it is achieved with the always constant free angle that the cutting result is even and that pressure is not exerted in a direction vertical to the pencil (seen in the direction of the illustration in Figs. 4 through 7) during the cutting process.

This brings about an exact forced guidance of the position of the pencil in relation to the knife blade in a technically simple manner.

It is pointed out that the chisel-shaped point on an elliptical pencil is the preferred application of this invention. The solution in accordance with the invention makes it possible, however, to realize the greatest number of different shapes that can be made through the linear overlaying of two curved surfaces with two fixed points, which are the pins.

Fig. 8 shows a second exemplary embodiment of the invention in a schematic illustration.

The sharpener 1 has a housing 10 upon which a detachable lid 60 is fastened. The housing 10 has a thin exterior wall 62. Within the thin exterior wall 62, a first intermediate part 64 and a second intermediate part 66 are arranged within the housing 10.

The first 64 and the second intermediate part 66 each have an essentially planar region 68, 70 which essentially runs perpendicular to the length axis 72 of a channel 74 that is arranged within the holding device and serves to receive a pencil 16 to be sharpened.

The first 64 and the second intermediate part 66 are positioned in a rotationally fixed manner in the housing in relation to the length axis 72. The first 64 and

the second intermediate part 66 each have a flange 76, 78 which extends in the outer region 80, 82 of a plate 80, 86 representing the planar area 68 or 70 perpendicular to the planar area 60, 70. The surrounding flanges 76, 78 engage the exterior wall 62 with their respective exterior upper surfaces 88, 90 turned away from the length axis 72. The end wall 92 turned away from the plate 86 of the second intermediate part 96 is supported against the first intermediate part 64. The plate 84 of the first intermediate part 64 and the plate 86 of the second intermediate part 66 each have an essentially circular opening 94, 96. An attachment 98 with a cylindrical part 100 and a conical part 102 formed onto it, extends in the area of the opening 94 of the first intermediate part 96 from the plate 84 in the direction away from the second intermediate part 66, whereby the cylindrical part 100 and the conical part 102 are each configured to be hollow.

On the end turned away from the second intermediate part 66, the conical part 102 has an opening 104, which connects the interior of the conical part 102 with the interior of the lid 60. A knife blade 12 is mounted on the attachment 98 at an angle to the length axis using a screw 11.

A cam 20 extends parallel to the flat areas 60,70 between the first intermediate part 64 and the second intermediate part 66, and makes contact with the first 64 and the second intermediate part 66 and is arranged for rotation about the length axis 72 relative to the first intermediate part 64 and the second intermediate part 66. The cam 20 on its two end walls 22, 24 respectively has endless grooves 26, 28, that make contact with the first intermediate part 64 or the second intermediate part 66, and which are asymmetrically positioned in relation to a plane defined by the cam 20. Pins which are

fastened on the first intermediate part 64 and the second intermediate part 66 respectively run in these grooves 26,28, so that the movement track, which the cam 20 can execute relative to the first intermediate part 64 and the second intermediate part 66 is determined by interaction of the pins with the grooves 26, 28. The cam 20 has a through going passage 106. A tube-shaped attachment 14a is formed onto the cam 20 around this through going passage on the side directed away from the first intermediate part 64, and extends through the opening 96 of the plate 86 of the second intermediate part 66.

The plate 86 of the second intermediate part 66 on its side turned away from the first intermediate part 64 further has a flange 108 extending perpendicular to the flat area 68, which is especially endless and serves to support a spring element 110, which is formed in particular as a spiral spring and supports itself against the second intermediate part 66. The spring element 110 is supported at the second end 112 against a disk 114 with an endless flange 116.

This disk 114 has a through going opening 118 adapted to the exterior contour of the tube-shaped attachment 14a through which this tube-shaped attachment 14a extends.

The disk 114 extends essentially perpendicular to the length axis 72 and is supported on the housing 10 at its end wall directed away from the spring element 110. For this purpose, the housing 10 in particular has a tube-shaped attachment 122 that surrounds the length axis 72. The disk in this way covers an opening 124 that extends through the exterior wall 62 of the housing 10 and has an opening surface that is larger than the surface defined by the exterior perimeter of the tube-shaped attachment 14a.

Fig. 9 shows a cutaway display along line 9-9 in Fig. 8.

Fig. 10 shows a side view from the direction of the arrow 126 in Fig. 8.

Fig. 10 in particular illustrates that the disk 114 in the direction perpendicular to the length axis 72 is moveably arranged relative to the housing 10 and the tube-shaped attachment 122 of the housing 10. The respective position of the disk 114 relative to the housing 10 is specifically determined by the respective relative position of the pencil 16 or the tube-shaped attachment or the cam 20 relative to the housing 10. The disk 114 biased by the action of the spring element 110 against the housing 10 follows the plane perpendicular to the length axis 72, in particular the movement of the tube-shaped attachment 14a, since it rests with its opening against the outside of the tube-shaped attachment. The spring element 110 prevents the disk 114 from separating from the housing 10 and on the other hand enables a flexible movability of the disk 114 corresponding to the movability of the tube-shaped attachment 14a.

Fig. 11 shows a cutaway view along the line 11-11 in Fig. 10.

Fig. 12 shows an exemplary embodiment of a sharpener described in the invention.

The sharpener 100 has a cap 102, a housing 103, a housing insert 108 and a rotatable insert 110.

A pencil 116 is also displayed in Fig. 12 having a length axis 118 and extending into the sharpener 100. This pencil 116 is not a component of the sharpener 100 itself.

The housing 103 is made of multiple parts and has a first housing part 104 and a second housing part 106.

The first housing part 104 is inserted into the second housing part 106 and is supported by the exterior surface 200 of its first wall section 202 on the interior surface 204 of the second housing part 106.

A second cam guide 122b is provided on the radially inwardly directed inner surface 206 of the first wall section 202 which can interact with a second cam 120b.

A second wall section 208 is provided radially inward from the first wall section 202, and has on its radially inwardly directed inner surface 210 a first cam guide 122a that can interact with a first cam 120a.

The first 202 and the second wall sections 208 are connected via a third wall section 212 of the first housing part 104 which extends essentially radially inward, has a ledge 214 upon which a cap 102 can rest, and at its radially inner end 216 has an opening 218.

A fourth wall section 220 is formed in one piece with the third wall section 212 essentially in the area of the opening 218, tapers in the direction away from the third wall section 212 and receives the point 222 of the pencil 116 in its interior space 221 for sharpening.

A knife blade 112 which is detachably fastened to the fourth wall section 220 using a screw 111 extends through a – preferably slit-shaped – opening in the fourth wall section 220.

The second housing part 106 is essentially bowl shaped and has a housing casing 160, that is preferably a wall area that is formed in an essentially elliptical shape, as well as a side cover wall 224 that is formed in one piece with the housing casing and extends essentially radially inwardly. This cover wall 224 has an opening 226 through which the pencil 116 can be inserted into the interior of the housing 228.

A fifth 230 and a sixth wall section 232 extend from this cover wall 224 in the vicinity of the opening 226 into the housing interior 228, whose radially inward inner surfaces 234, 236 extend essentially parallel to the length axis 118 of the guide sleeve 114.

The eighth cam guide 122h is arranged on the inner surface 234, which cooperates with the eighth cam 120h.

The seventh cam guide 122g is arranged on the inner surface 236, which cooperates with the eighth cam 120g.

The housing insert 108 that can basically be formed in one piece or as multiple parts is formed in two parts in the embodiment illustrated in Fig. 8 and is fitted into the housing 103 using a light pressure fit. The separating plane of both parts of this housing insert 108 extends essentially through a central length axis 119 of the housing 103 whereby these parts of the housing insert 108 are essentially arranged symmetrical to the separating plane. Both parts of the housing insert 108 are supported on one another in circumferential direction.

Both parts of the housing insert 108 can, accordingly assembled, basically form an essentially continuous mantle surface or a non-continuous, at least not completely continuous mantle surface.

In the embodiment shown in Fig. 12, the two parts of the housing insert 108, accordingly assembled form an essentially unclosed or not completely closed mantle surface. This is realized in the embodiment shown in Fig. 12 in such a way that both parts of the housing insert each have an essentially closed continuous wall section that forms an uninterrupted mantle portion, which in circumferential direction extends essentially parallel to the length axis 118 of the housing insert 108 and over a partial section in the circumferential direction. Flap-like extensions are connected to this continuous and breach-free mantle portion of the two parts of the housing insert, which extend in circumferential direction.

In the area of these flap-like extensions the mantle surface of the housing insert 108 extends in longitudinal axial direction of the housing insert 108 – does not extend over the entire length of the insert 108. The flaps of the different parts of the housing insert 108 support one another in circumferential direction. In the area of these flaps of the different parts of the housing insert, the outer diameter is selected compared to the inner diameter of the housing casing 160 such that a light pressure fit is generated upon insertion of the housing insert 108 into the housing 103.

The housing insert 108 has a third cam guide 122c that works together with a third cam 120c, a fourth cam guide 122d that works together with a fourth cam 120d, a

fifth cam guide 122e that works together with a fifth cam 120e, and a sixth cam guide 122f that works together with a sixth cam 120f.

The rotatable insert 110 also has a guide sleeve 114 with a non-rotational symmetrical elliptical mantle-like wall area 238 that is connected in one piece to the third 120c, fourth 120d, fifth 120e and sixth 120f cams.

The cams 120a, 120b, 120c, 120d, 120e, 120f, 120g, 120h, have been arranged on the exterior surface of this rotatable insert 110.

The first 120a and the eighth cam 120h are each formed from a section of the radially outwardly located exterior surface 240 of the mantle-like wall area 238 of the guide sleeve 114. Furthermore, the disk-shaped cams 120b, 120c, 120d, 120e, 120f, 120g extend in a radial direction from this exterior surface 240 of the mantle-like wall section 238, which if necessary have gaps 123 – as indicated by the reference symbols. The thickness of these disks is preferably between 1 mm and 10 mm and is especially preferred to be essentially 3mm. But other measurements can be used.

The first 120a, second 120b, third 120c and fourth cams 120d are arranged into a first group 242 and the fourth 120e, fifth 120f, sixth 120g and seventh cams 120h are arranged into a second group 244.

The cams 120a, 120b, 120c, 120d of the first group 242 are arranged, in this sequence, axially offset and adjacent to one another, whereby - in the embodiment illustrated in Fig. 12 – two respectively neighboring cams 120a, 120b, 120c, 120d of the cams 120a, 120b, 120c, 120d of the first group 242 essentially engage one another in an axial direction.

The cams 120e, 120f, 120g, 120h of the second group 244 are arranged, in this sequence, axially offset and adjacent to one another, whereby - in the embodiment illustrated in Fig. 12 – two respective neighboring cams 120e, 120f, 120g, 120h of the cams 120e, 120f, 120g, 120h of the second group 244 essentially engage one another in an axial direction.

The first group 242 is spaced in an axial direction from the second group 244.

The first group 242 is arranged essentially in the end region 246 of the guide sleeve 114 that is directed toward the fourth wall section 220 of the first housing part 104, whereas the second group 244 is arranged essentially in the end region 248 of the guide sleeve 114 directed away from the fourth wall section 220 of the first housing part 104.

The cams 120a, 120b, 120c, 120d of the first group 242 interact with the cam guides 122a, 122b, 122c, 122d associated therewith in such a way that each position of the rotatable insert 110 is defined in an essentially unique and repeatable manner in circumferential direction and at each rotation angle.

The cams 120e, 120f, 120g, 120h of the second group interact in a corresponding manner with the cam guides 122e, 122f, 122g, 122h associated therewith.

It is noted that instead of the two groups 242, 244 there can also be only one group or more than two groups. In addition, the number of cams assigned to a group can be selected differently in order to determine a position of the rotatable insert 110 at each rotation angle in an essentially unique manner. For example, three cams can be

equipped with correspondingly assigned cam guides. It is also preferable that neighboring cams of a group are separated – at least partially – from one another by an axial gap. Furthermore, the sequence of the cams in an axial direction can be arranged differently.

In a preferred embodiment the cams assigned to the same group 242, 244 differ in size.

Preferably, the cams 120a, 120b, 120c, 120d assigned to the first group 242 are arranged in a mirror symmetrical manner to the cams 120e, 120f, 120g, 120h assigned to the second group 244 and with respect to a plane of symmetry that is arranged perpendicular to the length axis of the rotatable insert 110. If necessary, the entire rotatable insert 110 is formed in a mirror symmetrical manner with respect to this plane of symmetry.

The interior contour of the guide sleeve 114 is rotation symmetrical, especially elliptical, and preferably adapted to the exterior contour of the pencil 116 that has an elliptical cross-section surface perpendicular to its length axis.

The cap 102 can be detachably connected to the first housing part 104. The configuration of the cap 102 is cylindrical in this application example. The cap 102 can be configured closed – away from the housing – to catch shavings that are cast off during sharpening.

Fig. 13 shows the sharpener 100 as viewed from the line 13-13 in Fig. 12.

Fig. 13 illustrates the elliptical configuration of the housing casing 160, which defines an elliptical interior space 106a. Furthermore, Fig. 13 shows the

cylindrical configuration of the cap 102. The knife blade 112 that extends through the slit 112b provided in the fourth wall section 220 into the interior space, and is detachably fastened to the fourth wall section 220 by means of a screw 11, has a cutting edge 112a.

Fig. 13 further illustrates the elliptical configuration of the opening cross-section 104a of the opening 218 facing the second housing part 106 and the circular configuration of the opening cross-section 104b of this opening 218 facing away from the second housing part 106.

Fig. 14 shows the sharpener 100 as viewed from the line 14-14 in Fig. 12.

The housing insert 108 is set into the housing casing 160 using a light pressure fit, whereby the two parts of this housing insert 108 are supported on one another by the circumferentially extending flaps 250, 252, 254, 256.

Fig. 14 also shows the first cam guide 122a, as well as the second cam guide 122a. The first guide surface 258a of the first cam guide 122a and the second guide surface 258b of the second cam guide 122b are respectively shaped planar and are axially offset from and parallel to one another.

The first cam 120a contacts in at least one rotational orientation, as shown in Fig. 14, first cam guide 122a in each rotation.

Fig. 15 shows a view along line 15-15 in Fig. 12.

The rotational position of the rotatable insert 110 in Fig. 15 corresponds to that shown in Fig. 14.

The cutaway illustration in Fig. 15 is seen in an axial direction opposite that from Fig. 14.

As can be seen in the regions 260 and 262 in Fig. 15, the parts 264, 265 of the housing insert 108 are spaced apart in circumferential direction in the axial position displayed there.

The second, elliptically formed cam 120b, engages the second cam guide 122b in at least one rotational position, especially in all rotational positions.

The first 120a and the second cam guide 120b are arranged relative to one another in such a way that their respective main axis is perpendicular to that of the other.

Furthermore, Fig. 15 shows the third 122c and the fourth cam guide 122d which respectively extend from the exterior wall 268 of the housing insert 108 inward as a type of separating wall, and especially perpendicular to the length axis 118.

The third guide surface 258c of the third cam guide 122c and the fourth guide surface 258d of the fourth cam guide 122d are also configured planar and axially offset and parallel to one another.

The third 258c and the fourth guide surface 258d are also arranged perpendicular to the first 258a and the second guide surface 258b.

The third cam 120c contacts the third cam guide 122c, at least in one rotational position, especially in all rotational positions. The circumferential surface of the third cam has two curved regions that rest against one another with their respective ends so that two essentially pointy transition areas 270, 272 are formed between the curved regions. These points 270, 272 lay opposite each other and are rotated clockwise approximately 45° relative to the large main axis 124a of the first cam 120a and counter clockwise approximately 45° relative to the large main axis 124d of the second cam

120b. The third cam 120c is configured in such a way that the curvature 123a toward the main axis 124b of the second cam 120b is somewhat rounder than the curvature 123b extending in the opposite direction. Furthermore, the third cam 120c is point symmetrical in the plane of view extending perpendicular to the length axis 118.

Fig. 16 shows a view along the line 16-16 in Fig. 12.

The entire rotatable insert 108 in Fig. 16 is rotated by 90 degrees relative to the position in Figs. 14 and 15.

The fourth cam 120d engages on the fourth cam guide 122d at least in one rotational position, particularly in all. The fourth cam 120d is mirror symmetrical to the third cam 120c in relation to the large main axis 124b of the second cam 120b.

Fig. 17 shows a view along the line 17-17 in Fig. 12.

The third cam 120c is asymmetrical. The sections 125a through 125d of the cam guides122a through 122h facing cams 120a through 120h are essentially configured planar.

Through the interaction of the cams 120a through 120d with the cam guides 122a through 122d, the guide sleeve 114 is held in each rotational position in such a way that the point of a pencil received in the guide sleeve 114 is guided along the cutting edge 112a.

The terms left, right, downward and upward are understood as follows: Upward and downward direction specifications are understood to be in the cutting plane perpendicular to the central longitudinal axis 119, and extending in a first direction. Left and right direction specifications are understood to extend in a second direction

perpendicular to the first direction. The position of the knife blade 112 is designated as upward. The first cam guide 122a by making contact with the first cam 120a prevents the rotatable insert 110 from moving upward. As shown in Fig. 15, the second cam 120b, which is located in an axial direction next to the first cam 120a, presents a guide upward; i.e. it prevents a downward movement of the rotatable insert 110. Fig. 16 shows the third cam 120c and its cam guide 122c. This prevents leftward movement of the rotatable insert 110 and ensures that the rotatable insert 110 is guided to the right. Fig. 17 shows the fourth cam 120d and the fourth cam guide 122d which cooperate to enable a guiding to the right. When viewed from the first housing part 104, there is a corresponding arrangement of four cams 120a to h and four cam guides 122g to 122h (two cam guides cannot be seen) at the back portion of the sharpener, which ensure a more even operation; in particular, jamming is prevented. The total number of eight cams 120a to 122h therefore make it possible for the rotatable insert 110 to move up and down in the direction of arrow 150 upon rotation and left and right in the direction of arrow 152(Fig. 17), so that the pencil rests against the cutting edge at each rotation angle position. The position of the rotatable insert 110 is determined uniquely by each rotation angle.

In a preferred embodiment, the rotatable insert 108 may be axially moved only in a limited number of rotational positions when the housing 103 is open, in particular during assembly. This can, for example, be one or two or three or four or more rotational positions. For the remaining positions, stops act in an axial direction, in especially both orientations of the axial direction.

The stops can, for example, be configured in such a way that cams in an axial direction strike, possibly alternately, against neighboring cam guides upon a load in an axial direction.

Fig. 18 shows an exemplary embodiment of the invention in a schematic illustration.

The sharpener 100 has a housing 103 with a first housing part 104 and a second housing part 106.

The second housing part 106 has a first housing wall section 400 and a second housing wall section 402 that is rigidly connected in one piece with the first housing wall section 400.

The first housing wall section 400 of the second housing part 106 is of annular-elliptical shape and extends about a housing length axis 404.

The second housing wall section 402 of the second housing part 106 extends essentially radially to the housing length axis 404. This second housing wall section 402 is formed as an elliptical plate and has an elliptical opening 406. An especially circular recess 408 extends about the opening 406 on the side of the second housing wall section 402 facing the interior of the housing 228.

An especially disk-shaped sealing element 410 is received in this recess. This sealing element 410 has an opening 412. This opening has an elliptical cross-section that is smaller than the elliptical cross-section of the opening 406 provided in the second housing wall section 402. The outer diameter contour of the sealing element 410 can, for

example, be circular whereby the diameter of the circle is smaller than the diameter of the circular recess 408.

The first housing part 104 is configured as one piece and connected permanently or detachable with the second housing part 106.

The first housing part 104 has a disk-like area 414 that extends essentially perpendicular to the housing length axis 404. This disk-like area 414 radially outwardly has an outer diameter contour that is essentially adapted to the inner diameter contour of the first housing wall section 400. An opening 416 is provided radially inward in the disk-like area 414.

A tab is provided on this disk-like area 414 that runs from this area 414 in the direction away from housing interior space 228 and receives the knife blade 112 by means of a screw 111.

Two flanges 510, 512 are further provided in the disk-like area 414 that protrude from the radially outer portion of the area 414 in axial direction and towards the housing interior space 228. The flanges 510, 512 radially outwardly are flush with the disk-like area 414 and are each formed as an annular elliptical section and are spaced from one another by a gap 417, 418 in the circumferential direction.

The first housing part 104 is axially inserted into the second housing part 106.

If necessary, a cap or a lid 102 is detachably fastened to the housing 103 to create a space 420 for the collection of shavings. This cap 102 can, for example, have an

offset 422 in its wall 424 and can be placed, especially centered, into or onto the first housing wall section 400 with an area 426 connecting to this offset.

Furthermore, an especially elliptical opening 428 is provided in the disk-like area 414 of the first housing part 104 through which the pencil 16 can reach to the knife blade 112.

There is a rotatable insert 110 arranged in the housing interior 228 that has a guide sleeve or bushing 114 and a support section 430 extending essentially radially to the length axis 404. This support section 430 is configured in such a way that it can absorb any tipping moments that act on the guide sleeve 114 about an axis, which is aligned perpendicular to the housing longitudinal axis 404.

In the embodiment illustrated in Fig. 18, this support section 430 is configured as a disk with a round outer diameter shape which is positioned axially at the end of the guide sleeve 114 and is connected with it in one piece. This disk is supported on the disk-like area 414 of the first housing part 104 and/or on the housing insert 108. The opening provided in this support section 430 corresponds – in particular with respect to the contour – to the opening 432 that is provided in the guide sleeve 114.

In the embodiment shown in Fig. 18 there is also a cam arrangement 434 that is configured as a one-piece cam insert 436 with three axially adjacent cams 438, 440, 442.

This cam insert 436 has an opening 444 that is configured in such a way that the exterior surface 446 of the guide sleeve 114 can be received in a form-fitting manner and essentially or approximately without looseness.

Each of the cams 438, 440, 442 works together with a cam guide 448, 450, 452. Accordingly, these cam guides 448, 450, 452, of which cam guide 452 is shown in Fig. 16, are offset in an axial direction and arranged next to one another.

The third cam guide 452 is formed by the interior surface 454 of an opening 456 that is provided in a first wall section 456 of the housing insert 108 that extends in a radial direction.

A second, radially extending wall section 460 of the housing insert 108 is provided axially spaced from the first radially extending wall section 458.

On the first 458 and the second radially extending wall section 460 there is a respective protruding web 462, 464 that is essentially formed straight and elongated. These webs 460, 462 serve as first 448 and a second cam guide 450 for the first 438 and second cam 440.

On one of the wall sections 458, 460, two flanges or wall sections 492, 494 that extend in axial and circumferential directions are positioned radially outside, are spaced in a circumferential direction and are therefore not displayed in the cutaway view of Fig. 18.

An opening 466 is provided in the second radially extending wall section 460 of the housing insert 108 through which the guide sleeve 114 extends.

The first 438 and the second 440 cams are arranged in an axial direction between the first 458 and second radially extending wall section 460 of the housing insert 108.

Fig. 19 shows a view along the line 19-19 from Fig. 18 with the lid 102 removed.

The first housing wall section 400 of the second housing part 106 can be seen in Fig. 19.

The second housing part 104 is inserted into this first housing wall section 400, upon which an extension 480 is provided that receives the knife blade 122 by means of a screw 111.

Furthermore, a section of the opening 428 of the first housing part 104 can be seen.

Fig. 20 shows a cutaway view along the line 20-20 from Fig. 18 displayed at a 90° rotation.

Fig. 20 shows the cam insert 436, which contains the first cam 438 and the second cam 440. The cams 438, 440 are rigidly connected with a sleeve 490 whose top surface forms the third cam 442 in an axially offset plane.

Fig. 20 also shows the guide sleeve 114.

The cam insert 436 or the sleeve 490 of the cam insert 436 are arranged circumferentially about this guide sleeve 114 and in a form-fitting manner.

Fig. 20 also shows the first cam guide 448 configured as a web 462 and – designated by cross-hatches – the second cam guide 450 configured as a web 464.

Figure 20 also shows two wall sections 492, 494 positioned rigidly on the radial wall section 458 of the housing insert 108 and extending radially outside in a

circumferential direction and axially, between which there are gaps 469, 498 seen in the circumferential direction.

The respective first 438 and/or second cam 440 can extend into these gaps at an appropriate rotational position.

Fig. 21 shows a cutaway view of the embodiment of Fig. 18 along the line 21-21 displayed at a 90° rotation.

Fig. 22 shows a cutaway view of the embodiment of Fig. 18 along the line 22-22 displayed at a 90° rotation.

Fig. 22 also shows the flanges 510, 512 on the disk-like area 414 of first housing part 104, which protrude in an axial direction from the radially outer portion of the area 414 and facing the housing interior space 228. The gaps 416, 418 in the circumferential direction between these flanges 510, 512 are also displayed.

Fig. 22 also shows the support section 430 –configured here as a disk – as well as the opening 432 running through this support section 430 or the guide sleeve 114.

The opening 428 of the first housing part 104 is designated by the line 514, which in Fig. 22 is partially covered by the support section 430.

Lines 430a and 432a show the position of the support section 430 and the opening 432, when a pencil or the guide sleeve 114 is rotated during sharpening by 90 degrees relative to the position described previously in Fig. 22. As can be seen from these different positions of the support section, the latter extends temporarily during sharpening – in particular alternatingly - into the gaps 418, 418.

Fig. 23 shows an exemplary embodiment of the invention in a schematic illustration.The sharpener 300 shown in Fig. 23 differs from the exemplary embodiment shown in Fig. 18, in particular by the configuration of the rotatable insert 110 and the configuration of the cam arrangement 434.

The rotatable insert 110 is connected in one piece with the cam arrangement 434 in the exemplary embodiment shown in Fig. 23. Further, the rotatable insert 110 as shown in the embodiment of Fig. 23 does not have the disk 430 described in Fig. 18 which is arranged in that embodiment between the housing insert 108 and the disk-like area of the housing insert 104.

In the embodiment according to Fig. 23 another sealing device or sealing disk 530 is provided at the mentioned position. The sealing devices 410 and 530 are – as seen in an axial direction – positioned on different sides of the housing insert 108. The sealing device or sealing disk 530 radially inwardly has an opening 532 through which the guide sleeve 114 of the rotatable insert extends.The cam arrangement 434 is arranged in the exemplary embodiment of Fig. 23 so that the first 438 and second cam 440 are arranged on both axial sides of a radially extending disk 534, which are engaged from radially outside by the respective cam guide 448 or 450.

A material free gap 536 or 538 is provided in radial direction between the first 438 or second cam 440 and the guide sleeve 114.Furthermore, in the embodiment shown in Fig. 23, flanges 540, 542 are provided at the radially outer end of the disk 534 which extend in positions of the circumference which, for example, each extend along a circular section and are circumferentially spaced by gaps 544, 546.

In the configuration shown in Fig. 23, the third cam 442 is formed by a top surface area of the guide sleeve 114.

Fig. 24 shows a cutaway view of the embodiment shown in Fig. 23 along the line 24-24 displayed at a 90° rotation with the lid 102 removed.

Fig. 25 shows a cutaway view of the embodiment shown in Fig. 23 along the line 25-25 displayed at a 90° rotation.

Fig. 25 shows that the guide sleeve 114 of the rotatable insert 110 is connected in one piece with the first cam 438.

Furthermore, Fig. 25 shows a first cam guide 448 rounded off radially outwardly and formed planar radially inwardly. The first cam guide 448 extends into the gap 546 or possibly into the gap 544 at a corresponding rotational position of the rotatable insert 110.

Fig. 26 shows a cutaway view of the embodiment shown in Fig. 23 along the line 26-26 displayed at a 90° rotation.

Fig. 26 illustrates that the guide sleeve 114 of the rotatable insert 110 is connected in one piece with the second cam 440.

Furthermore, the second cam guide 450 as shown in Fig. 26 is configured in such a way as it would be illustrated using Fig. 25 in relation to the first cam guide 448.

Fig. 27 shows a cutaway view of the embodiment shown in Fig. 23 along the line 27-27 displayed at a 90° rotation.

Fig. 27 shows that the third cam 442 is formed from an area of the guide sleeve 114 or an area of the exterior surface of the guide sleeve 114.

Figs. 28 through 32 show different views or cutaway views of an exemplary embodiment of the invention that resemble the embodiment illustrated in Figs. 18 through 22.

The configurations in Figs. 28 and 32, on the one hand, and Figs. 18 through 22, on the other hand, differ from each other, apart from their geometry, and in particular the geometry of the cams 438, 440, 442, in the relative arrangement of the first cam guide 448 relative to the second cam guide 450.

Whereas these cam guides 448, 450 and their perpendiculars in the embodiments of Figs. 18 through 22 encompass an angle of approximately 145 degrees, this angle in the embodiments of Figs.28 through 32 is 120 degrees. It is noted, however, that other angle ratios may be preferred in accordance with the invention.

Fig. 33 and 34 each show a partial cutaway of an exemplary embodiment of the invention in schematic form.

Figs. 33 and 34 show an example of how the shape of the point 560 can be formed.

Figs. 33 and 34 each show on one side a cross-section through a guide sleeve 114 and a section of this guide sleeve 114 with a section of a pencil 562 arranged in it.

In the embodiment shown in Fig. 33, the guide sleeve 114 has a wall thickness that is not constant in the circumferential direction. In this exemplary

embodiment, the thinnest wall thickness 564 is in the area of the small major axis of the annular, elliptical cross-section and the thickest wall thickness 566 is in the area of the large major axis.

A relatively flat point 560 of the pencil 562 to be sharpened – in comparison to the embodiment in Fig. 34 - can be achieved by means of this guide sleeve 114.

The embodiment in Fig. 34 has a constant wall thickness of the guide sleeve 114 in the circumferential direction.

The guide sleeves 114 shown in Figs. 33 and 34 can be used in the embodiments shown in Figs. 18 to 32.